

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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SECURITY INFORMATION

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COUNTRY	USSR (Kalinin Oblast)	REPORT NO.	<input type="text"/>
SUBJECT	Angular Velocity Transducer Project at Gorodomlya Island, USSR	DATE DISTR.	3 June 1953
DATE OF INFO.	<input type="text"/>	NO. OF PAGES	25X1A5
PLACE ACQUIRED	<input type="text"/>	REQUIREMENT NO.	<input type="text"/>
	25X1A	REFERENCES	<input type="text"/>

THE SOURCE EVALUATIONS IN THIS REPORT ARE DEFINITIVE.
THE APPRAISAL OF CONTENT IS TENTATIVE.
(FOR KEY SEE REVERSE)

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SOURCE:

1. A transmitter was to be developed for the Bahnmodell which was to deliver an electrical signal exactly proportional to the rotation speed of the rotary system (Drehsystem) in the Bahnmodell. The movement or speed of rotation of the rotary system encompasses a maximum angle spread of plus-minus 20 degrees, with angular velocities from two degrees per minute to two cycles per second. The transferred electrical value should, by reversal of the rotary system, vary the plus-minus indications correspondingly. The instrument was connected to a modulator with a high input resistance.
2. The transduction principle was made use of in the design of this transducer. The rotary system moves or activates a coil (Schwingspule) back and forth in the magnetic field which is constant over the angular dial sector (Winkelbereich). An electromotive force (EMF) is induced into the coil winding. The force corresponds to the following formula:

$$e = \frac{-d\phi}{dt} = -K.V.BL$$

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(Note: Washington Distribution Indicated by "X". Field Distribution by "#").

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This force is directly proportional to the speed with which the coil is moved through the magnetic field. No energy output is drawn from the coil, so that the entire EMF is present at the output terminal.

3. The arc-shaped core which is enclosed by the moving coil is located in the center magnet assembly [see sketch on page 4]. Opposed to each other on the upper and lower sides of the core are two pole arcs or curves with an air-gap distance of four millimeters. The exciter coils are arranged between the pole arcs and magnet yoke arcs. The magnet yokes and the head or end yoke provide the magnetic returns. The flux which is inclosed by the coil has a decided linear course of a positive maximum in the one-limit position, zero in the center, and a negative maximum at the other extreme-limit position. The air gap must be identical throughout, and the ferromagnetic circuit must not be saturated.
4. The moving coil has an open box end construction. It is built as lightly as possible in order to achieve a minimum additional moment of inertia. In order to avoid eddy currents and their reaction on the measuring value, the coil bobbin is fabricated from glued paper rather than from metal, and is held by two end frames of impregnated fabric. The coil is wound in layers; each layer is painted with synthetic resin and covered with a paper layer of ten microns. After the winding is completed the coil is pressed and hardened, forming a strong hollow body.
5. The testing results and methods for this particular transducer were as follows:
 - a. In addition to the general experiments and tests for insulation and puncture or dielectric strength (Spannungsfestigkeit), the testing of the angular velocity transducer included a particular testing of the field in the air gap or space. For this latter test, the moving coil was placed in various positions between plus 20 degrees and minus 20 degrees and the circuit closed and opened. The induced voltage during the closing and opening of the moving coil was measured with a ballistic galvanometer. The result was a constant induced voltage over the required angular range. The error margins lay within the measuring accuracy stipulations. The given voltage at two degrees per minute was approximately 20 mV at two cycles per second, and the full angle sweep was about 15 V and was proportional to the speed. The working point of the ferromagnetic circuit was slightly below the break in the magnetization curve.
6. The angular velocity transducer was installed in all Bahnmodells beginning with the sixth one. [redacted]

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[redacted] Comment. The angular velocity transducer, as described [redacted] is an odd arrangement of magnetic fields producing both a constant flux density in the air gap

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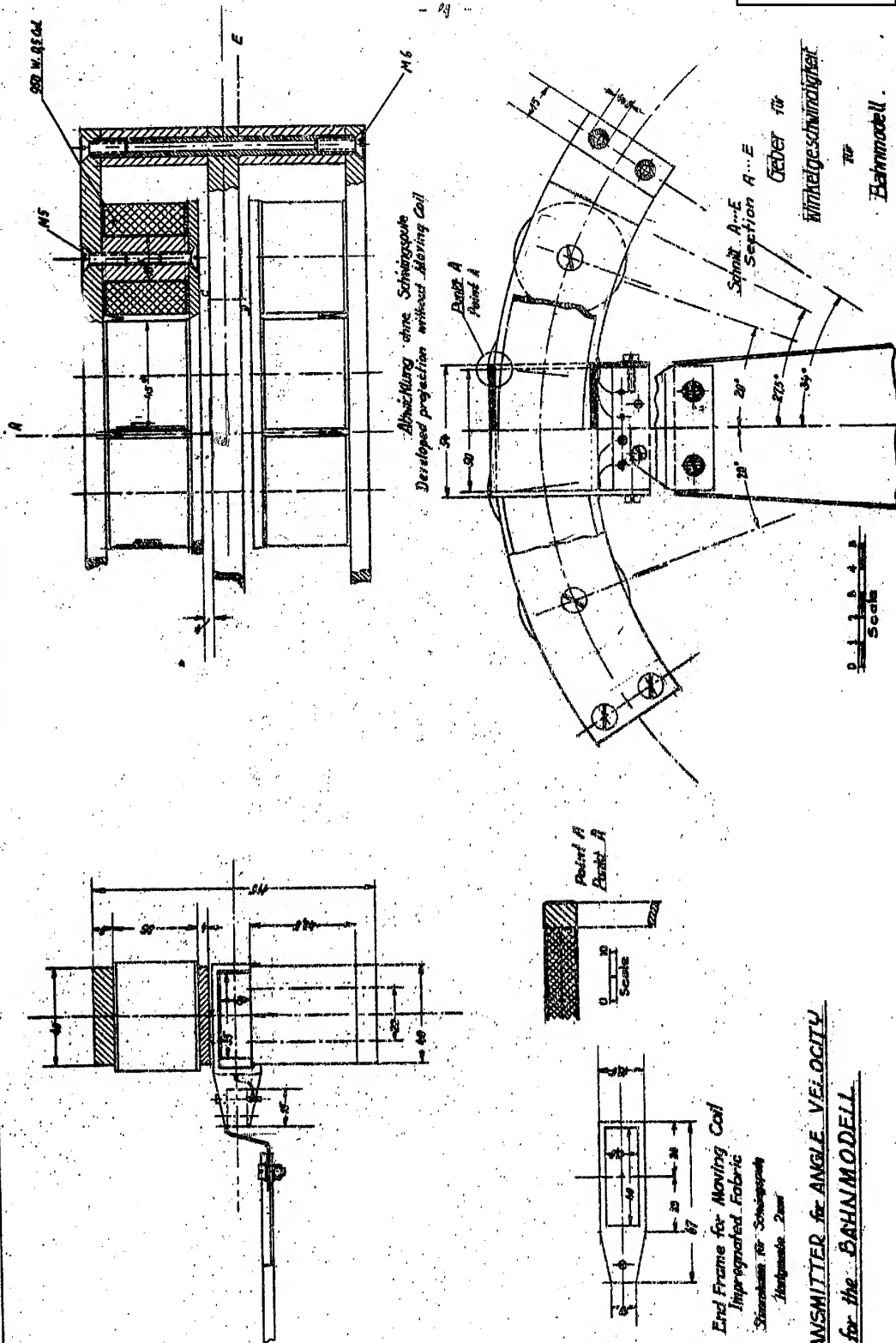
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along the length of the arc where angular velocity is measured, and a flux density in the core that is directly proportional to the distance along the arc. The voltage is generated proportional to velocity. Source claims that the method is used (i.e., the constantly changing flux density in the core) because it is easier to produce this type of field than one of constant density. This method sounds obscure, because, in developing the changing field, one must produce a uniform field across the air gap. There may be some ramifications to this treatment that the source does not understand, such as compensation in the unusual manner of the magnetic field arrangement. In any event, there are simpler ways to obtain angular velocity. This appears to the interrogating officer to be a primitive use of theoretical fundamentals.

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TRANSMITTER for ANGLE VELOCITY
for the BAHNMODELL

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Legend for Moving Coil

2 x 5,000 W. .07 Coulombs

20 layers - 550 turns

Frame paper .2 mm

20 layers paper .2 mm

20 layers lacquer .1 mm

20 layers wire 1.4 mm

Play .6 mm

Coil thickness 2.5 mm

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